



Take Charge with Case Management: Diabetes and Carbohydrate Counting

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Carbohydrate Factors and Precise Meal Planning

Meal planning is one of the cornerstones of diabetes management, and carbohydrate counting is one of the basics of meal planning. Keeping track of the amount of carbohydrate you eat is important because carbohydrate (rather than protein or fat) is the type of nutrient that affects blood glucose levels the most. Both eating moderate amounts of carbohydrates and spreading out the total amount of carbohydrate eaten over the day can help with blood glucose control. Carbohydrate counting additionally allows people who use short-acting insulin or rapid-acting insulin before meals to fine tune their premeal insulin doses based upon the amount of carbohydrate they plan to eat.

There are several methods of counting carbohydrates, and one of the most precise is using carbohydrate factors to calculate the amount of carbohydrate in a portion of food. To use this method, the weight (in grams) of a portion of food is multiplied by the percentage of the weight of the food that is carbohydrate (and not protein, fat, water, or other substances).

For example, carbohydrate accounts for 15% of the weight of any apple. If a particular apple weighs 225 grams, the amount of carbohydrate in that apple can be calculated as follows: 225 grams X 0.15 = 34 grams of carbohydrate.

This method can be particularly useful when eating foods that vary by size, such as fresh fruit, or that are not easily measured by other means. For example, if the label on a package of potato chips lists the serving size as 15 chips but most of the chips in the bag are broken, it's nearly impossible to know how many chip pieces make up 15 whole chips. But you can weigh even the smallest potato chip crumbs and multiply the weight by the carbohydrate factor for potato chips.



Finding Carbohydrate Factors

Before you can use the carbohydrate factor of a food to evaluate your portion, you must know what it is. Perhaps the easiest way to get the carbohydrate factor for a food is to take the information from the Nutrition Facts panel that is on the label of all packaged foods. The Nutrition Facts panel on a box of Rice Krispies, for example, says that one serving of the cereal is 1 1/4 cups, which weighs 33 grams (under laboratory conditions). The Total Carbohydrate line shows that one serving contains 29 grams of carbohydrate. To get the carbohydrate factor for this cereal, divide the weight per serving (33 grams) into the total carbohydrates per serving (29 grams) for a carbohydrate factor of about 0.88.

To use this information, put your cereal bowl on your gram scale and zero it out. Pour in whatever amount of cereal you want, and multiply the weight by the carbohydrate factor (0.88). Then, while the bowl of cereal is still sitting on the gram scale, zero out the scale and pour in the milk. Use the carbohydrate factor for milk (0.05) to figure how many grams of carbohydrate you've added to the cereal. If you want some banana slices in your cereal, zero out the scale again and slice in as much banana as you want. Multiply the weight of the banana slices by the carbohydrate factor for bananas (0.23), and add that to your running total. Result? One bowl of cereal with the exact amount of carbohydrate known—and only one bowl and one spoon to wash.

To use carbohydrate factors correctly, you must weigh the food exactly as you will eat it. If you peel the food before eating it, you should peel it before weighing it. If you cook the food before eating it, you should cook it before weighing it.

Here, however, some caution is in order. The Nutrition Facts information found on packages of rice, pasta, popcorn, dried legumes, and similar foods is for the

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raw or dry item, not the cooked product, so you cannot use the label information the way you can for cold cereal. For items like these, it's better to use a resource such as the USDA National Nutrient Database for Standard Reference, a searchable government Web site located at www.nal.usda.gov/fnic/foodcomp/search, which lists nutrients in cooked portions of food as well as uncooked.

Analyzing Recipes

Once you know how to figure and use carbohydrate factors for individual foods or combinations of foods, you can use them to analyze recipes with multiple ingredients, as well. It's merely a matter of figuring the grams of carbohydrate for each ingredient, adding them up, preparing the dish, than weighing the entire dish and dividing the weight of the dish by the total number of grams of carbohydrate in the dish. The result is the carbohydrate factor for the dish.

Say you are making a pot of chili using canned goods and packaged seasonings. Using the information on the labels, list the ingredients, amounts to be used, and grams of carbohydrate in those amounts. For the chili, it would look like this:

1 pound hamburger	0 grams
1 can (14 oz) diced tomatoes	14 grams
1 can (15 ½ oz) kidney beans	80 grams
1 package seasoning mix	<u>20 grams</u>
TOTAL	114 grams

After its cooked, weigh the entire batch of chili on your gram scale. Take the total weight and divide that into 114 (the total grams of carbohydrate in the recipe). The result is the carbohydrate factor for your pot of chili.

Now place the bowl you will eat from on your scale, zero it out and ladle up however much you want to eat. Multiply the weight of your portion by the carbohydrate factor.



A Lifetime of Calculations?

At first, using carbohydrate factors requires a fair amount of time and arithmetic, but over time it gets easier. For one thing, most people eat the same 75 foods over and over again. If you remember to write down the carbohydrate factors of the foods you eat regularly, there's no need to recalculate them. Simply keep a list in a convenient place to use when you are ready to eat. For recipes, write the carbohydrate factor on the recipe card or in the cookbook.

Who can benefit?

Using carbohydrate factors can be a useful addition to the diabetes toolbox of anybody who wants to improve his overall blood glucose control. For people who use insulin, getting a really accurate carbohydrate count can mean more accurate dosing of pre-meal rapid-acting insulin and perhaps fewer episodes of high or low blood glucose.

For people who use oral diabetes medicines or who manage their diabetes with diet and exercise, using accurate carbohydrate counts can make it easier to eat consistent amounts of carbohydrate from one day to the next, and that can make it easier to determine whether their intake of carbohydrate matches their pancreas's output of insulin. You know you have a good match when blood glucose levels two hours after the beginning of a meal are within target range. If your blood glucose levels after eating are consistently higher than your goal range, you can precisely lower your carbohydrate intake and assess the change. Keep in mind, however, that not all blood glucose control problems can be resolved by eating less carbohydrate and that cutting out entire categories of food can leave your diet low in necessary nutrients. If you're having trouble with blood glucose control in spite of following a balanced diet, speak to your diabetes team.

So the next time you need to calculate your food intake, why not leave the measuring cups and spoons in the drawer and pull out a gram scale instead? Think of it as another "factor" in helping you manage your diabetes.

(From [Diabetes Self-Management](#). Dana Armstrong. August 2006.)

What Does the Doctor Mean By: Carbohydrate Counting??

CARBOHYDRATE COUNTING is a meal-planning method that involves keeping the total carbohydrate intake at each meal consistent from day to day, with the aim of improving overall blood glucose control. Carbohydrate counting has become increasingly popular since the American Diabetes Association (ADA) changed its dietary recommendations in 1994. Based on growing scientific evidence that sugar affects blood glucose levels no differently than other carbohydrates, and that no single meal-planning method works for everyone, the new guidelines essentially lifted the “ban” on sugar-containing foods to focus attention on controlling total carbohydrate intake and individualizing meal plans.

Carbohydrate counting was first embraced by individuals on intensive insulin therapy who used an insulin pump or multiple daily insulin injections. Carbohydrate counting helps people who use insulin tailor their meal-time dose or bolus of insulin to cover the amount of carbohydrate eaten at that meal. However, more and more people with diabetes who don't use insulin are now taking up carbohydrate counting because it helps control blood glucose levels.

Only the carbohydrate (not the fat or protein) in foods causes a significant rise in blood glucose level after eating. How much it rises depends on the amount of carbohydrate in the foods eaten, the size of the portions, and the amount of insulin available in the body. Eating the same amount of carbohydrate at the same meals and snacks every day can make it easier for a person to keep his blood glucose levels consistently within his target range and to see any unusual patterns of highs or lows.

To determine how many grams of carbohydrate you should eat at each meal or snack, it helps to work with a registered dietitian, who can assess your overall caloric needs and examine your blood glucose patterns to see how your body responds to food. Keeping careful records of the foods and portion sizes you eat, the medicines you take, and your activity and blood glucose levels throughout the day will make it easier to fine-tune your meal plan. Once you've determined your carbohydrate goals, you can choose what you'd like to eat and what portion size you can consume at each meal to meet those goals.

For example, if you are allotted 60 grams of carbohydrate at breakfast, you could combine a number of different foods, including the following: A) 1/2 cup orange juice (15 grams carbohydrate), 1 scrambled egg (less than 1 gram), two slices of toast (30 grams), and 1 tablespoon jelly (15 grams); or B) 1/2 cup shredded wheat (15 grams) with one cup skim milk (15 grams), and a 2-ounce bagel (30 grams) with cream cheese (0 grams). These two meals vary in terms of protein, calorie, and fat content, but they should have a similar impact on blood glucose level and require the same amount of insulin.

Because you can substitute one carbohydrate-containing food for another, carbohydrate counting gives you the flexibility to enjoy your favorite sweets on occasion. But doing that too often can lead to a nutrient-poor diet. The mainstay of a healthy diet remains a rich variety of vegetables, fruits, and whole grains, along with low-fat dairy products and fish.

Carbohydrate counting only works if you accurately measure portion sizes of the foods you eat. Underestimating the amount of carbohydrate in a jumbo size bagel or even a large apple can affect your blood sugar readings later in the day. Food items that are pre-portioned (such as sliced bread) and have detailed labels that spell out the carbohydrate content of each serving make the job easier. To accurately measure the proper serving sizes for some foods, though, you may need to use a food scale, measuring cups, or measuring spoons.

If you currently use the exchange system, you can easily convert to carbohydrate counting simply by noting the grams of carbohydrate in each exchange in your meal plan. One starch, fruit, or other carbohydrate exchange contains 15 grams of carbohydrate; one milk exchange contains 12 grams of carbohydrate; one vegetable exchange contains 5 grams of carbohydrate; and one meat or fat exchange contains 0 grams of carbohydrate.

(From Diabetes Self-Management. October 2004.)



More On Carbohydrate or Carb Counting

There are actually two types of carb counting. The first type, often called *basic* or *consistent* carb counting (or, as one of the doctors at Joslin likes to say, "CC"), is usually what most people with diabetes learn about these days. Basic carb counting isn't a diet, but rather a tool to help you better plan meals and learn how your food choices affect your blood glucose levels.

As you may know, most of the carbohydrate we eat turns to glucose (sugar) during digestion. Our bodies then use this glucose for energy. Let's review the types of foods that contain carbohydrate:

- Bread, pasta, cereals, rice
- Starchy vegetables (corn, peas, potatoes, lima beans)
- Fruit and fruit juices
- Milk and yogurt
- Sweets and desserts

(Non-starchy vegetables, such as broccoli, green beans, and carrots have a little carb, but not enough to affect blood glucose levels unless you eat large amounts.)

Many people "count" carbs using grams. One carb choice, or serving, is the amount of food that contains 15 grams of carbohydrate. Whether you eat 15 grams of carb from a piece of bread or 15 grams of carb from a cookie, the effect on your blood glucose level is about the same. You can learn how much carbohydrate is in your foods by reading food labels for serving size and total carbohydrate.

The goal with *basic* carb counting is to aim to eat a consistent amount of carbohydrate at your meals on a day-to-day basis. If you eat more carbohydrate than usual at a meal, for example, you'll probably have a high glucose level later on. Eating a certain amount of carbohydrate at meals, along with getting regular physical activity and taking your diabetes medicine as prescribed, is an effective way of controlling blood glucose levels.

How do you know how much carb you should aim for at your meals? A dietitian is the best person to help answer this but you can also see the chart on the following page. (See "How Much Carb Do I Need?") If you're interested in trying carb counting, you might aim for about 45 to 60 grams of carbohydrate (or three to four carbohydrate choices) at each meal until you meet with a dietitian.

The next type of carb counting is really more like the next "level" of carb counting. Sometimes it's called *advanced* carb counting, although it has nothing to do with how smart you are! Advanced carb counting is a very flexible way of meal planning that can be used by people who take fast-acting insulin (lispro, aspart, glulisine or Regular) before meals, whether by injection or via an insulin pump (you can't do advanced carb counting if you take only diabetes pills or long-acting insulin). Here's how it works: Right before you eat a meal, you figure out how much carbohydrate you'll be eating. Then, using something called an *insulin-to-carb ratio*, you calculate how much insulin you need to take to "cover" the carbohydrate in your meal. Let's say you have an insulin-to-carb ratio of 1:15. This means that you need to take 1 unit of your fast-acting insulin to cover every 15 grams of carb you eat. So, if you plan to eat 45 grams of carb at your meal, how much insulin would you need? If you guessed 3 units, you're right! Pretty easy to do!

Of course, you need to keep a few things in mind. First, your health-care team (usually your dietitian) should help you figure out your own insulin-to-carb ratio. Ratios vary from person to person, and you may even need different ratios for different meals. Second, be prepared to keep food records and check your blood glucose levels after meals for a while to make sure your ratio is correct. Third, if your blood glucose level is too high before a meal, you need to take extra insulin, along with the insulin to cover your carbs. This extra insulin is called a correctional dose and also needs to be calculated with the help of your health-care team. Finally, while advanced carb counting really gives you the flexibility of eating as much or as little carb as you want while still maintaining good diabetes control, don't forget that you still want to eat a variety of foods and not load up on empty calories found in desserts and snack foods. Also, it's not uncommon for people to gain weight when they start adjusting their insulin for their food intake. If you're trying to lose or maintain your weight, you still may want to aim for a certain amount of carb at your meals, along with keeping portions of protein and fat foods in control, too.

HOW MANY CARBS DO I NEED?

Fill in the blanks below to determine how many grams of carbohydrate you need each day by hand or use our interactive [Carb and Calorie Estimator](#).

1. First determine your desired weight in pounds:
 - a. If you are overweight, a 10% loss from your current weight is ideal.

desired weight = lbs.

- b. Or base your ideal weight on this formula:

Women: 100 lb. + $5 \times$ _____ in. = _____ lbs.

Men: 106 lb + 6 X _____ in. = _____ lbs.
inches over 5 ft. your goal wt

- c. Use this weight if you have an average frame.

for a light frame, subtract 10% = _____ lbs.
for a heavy frame, add 10% = _____ lbs.

2. Choose a calorie factor that describes your activity level:

	Very sedentary	Sedentary	Moderately active	Active	Super active
men	13	14	15	16	17
women	11.5	12.5	13.5	14.5	15.5

- 3. Determine your total daily calorie need:**

_____ lbs X _____ = _____
desired wt. cal. factor cal/day

4. Then divide by 8 (1/2 of calories as carbohydrate and 1/4 gram per calorie) to determine how many grams of carbohydrate (CHO) you need each day:

_____ / 8 = _____
cal/day grams of carb/day

- 5.
 6. And last, decide how you want to split up this total daily carbohydrate for different meals during the day.(See example)



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Having diabetes is hard work, especially when it comes to meal planning. In fact, many people with diabetes find meal planning to be the most challenging aspect of having diabetes. There's so much to think about: carbohydrate, timing of meals, reading food labels, controlling portions... Speaking of food labels and portions, have you ever stopped to think about the difference between a *serving size* and a *portion size*? Well, they're the same thing, right? Sorry, but that's wrong. It's important to know the difference between the two, not only for blood glucose control but for weight control as well. Let's take a closer look.

What determines serving sizes? Foods that are measured in bulk, such as cereal or flour, are typically listed in common household terms, such as cups, tablespoons, teaspoons, or fluid ounces. Foods that are divided up to serve more than one person, such as pizza or cake, are listed in a fractional amount, such as 1/4 pizza or 1/12 cake. Serving sizes for foods that come in "discrete units," such as bread or cookies, are usually listed as "1 cookie (30 grams)" or "2 slices bread (50 grams)."

No doubt you've read a label and shook your head thinking, "There's no way that just one cookie is a serving size," or "Who eats just 1/2 a cup of ice cream?" it's very important that you always look at the serving size on a Nutrition Facts label because all of the nutrients listed on that label,

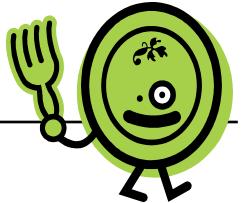
.Diabetes Population Health Clinic

*Location: Neurology Clinic
2nd floor, Bradley Bldg.*

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**For More Information:
Call Ms. Rebecca Ramirez, RN.,
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(915) 569 1963**



Serving Size vs. Portion Size: Which is Which?

such as fat, carbohydrate, and sodium, are based on the serving size. If you end up eating twice or three times as much as the serving size, the amount of carbohydrate (along with calories and fat) will double or triple, thereby affecting your blood glucose levels and possibly your weight, too.

A "starch exchange" or a "carb serving" is a particular amount of food that provides about the same number of calories and carbohydrate as another, similar food. For example, a 1-ounce slice of bread contains about 80 calories and 15 grams of carbohydrate, the same as in 1/3 cup of cooked pasta. But the serving size on a box of pasta is two ounces (dry). Cooked, those two ounces of pasta yield 1 cup, which contains roughly 45 grams of carbohydrate. Tricky, isn't it? A good piece of advice is to always go by what's listed on the food label, if it's available, rather than on a food list.

What's the difference between serving size and portion size? A **serving size** is a unit of measure that describes a recommended amount of a certain food. A **portion size**, on the other hand, is the amount of a food that you choose to eat. For example, a serving size of Fritos corn chips is 1 ounce, or 32 chips. Your **portion size**, however, might be more like 3 ounces or close to 100 chips. Portion sizes aren't necessarily always larger than serving sizes. You might eat only 15 Fritos, which is the portion size.